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QUIET OPERATION OF AN/PRC-77 RADIOS

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Final Report

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The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

INTRODUCTION

During the Southeast Asia conflict, Army patrols operating in enemy territory found that they could not use their tactical radios without danger of giving away their position. This occurred because audible voice signals frequently carried over long distances. The USA Land Warfare Laboratory was asked to develop a silencing technique which would prevent voice sounds from being heard at distances greater than three feet from the source.

The USALWL investigated three possible solutions to the problem. All were based upon the principle of containing sounds by enclosing the paths between the earphone and the operator's ear, and between his mouth and the microphone. In addition, two of the approaches included microphone signal amplifiers which permitted the operator to whisper.

Of the three devices which were developed, two were judged to be suitable for field use and were subjected to a military potential test by the Rangers at Eglin Air Force Base, Florida.

This report describes the developed items and discusses the test results.

RESULTS

Development Effort

The initial approach was to adapt the headsets presently used by jet aircraft ground crew personnel. These have molded plastic cups lined with foam for the mouth and ears which are normally used to block out the high noise environment of the jets so that communication is possible. For the present application, quiet operation of tactical radios, they were used in reverse to keep sound in. The transmitter was installed in the mouth cup and the receiver in one ear cup (see Fig. 1). To achieve truly silent operation, the operator must whisper. This required the addition of a preamplifier so that the microphone signal would be adequate. A "whisper-talk" switch was provided to change the gain so that the headset could also be used for normal operation. The pre-amplifier and switch were installed in the mouth cup. The ear cup not containing the receiver was opened to the air so that the operator could hear external sounds. Two such headsets were modified and tested with AN/PRC-77 Radios. In the whisper mode, silent operation was achieved. However, in LWL tests, military personnel considered the sets too bulky and cumbersome to be acceptable for field use and this approach was abandoned.

The next approach was the silencing of the handset H-189 with cups over the microphone and receiver (see Fig. 2). The microphone cup is a foam rubber cylinder coated on the outside with silicone rubber to keep the sound in. The receiver cup is molded neoprene lined with foam rubber and with a slit across the bottom. When the receiver is pressed against the ear, the slit opens to let sound out to the ear. When the receiver is removed from the ear, the slit closes to keep sound in. It is an original, patented development

of USALWL called an "ear valve".

A third approach was the development of a small lightweight silent headset. This headset, developed by Electro-Voice, Inc. is shown in Figure 3. It consists of a lightweight headband to which a receiver/microphone unit is attached. The receiver is connected to the ear with a plastic tube. The microphone is connected to the mouth with a small rigid tube, the end of which is enclosed in a foam rubber mouth piece attached over the mouth with a strap. The push-to-talk switch is provided on a separate cord so that it can be attached to a gun stock or a cartridge belt. The microphone pre-amplifier with a "whisper/talk switch" is installed in the cord between the headset and the tactical radio. Figure 4 shows the lightweight silent headset attached to a PRC-77 radio set.

Tests

The Electro-Voice headset and the foam adaptors for the H-189 handset were field tested by the Ranger Detachment at Eglin Air Force Base, Florida. The Rangers reported that both devices rendered the tactical radio silent for voice communications. However, the foam rubber material used in both the handset adaptors and the headset mouth piece was irritating to the skin of users. In addition, the headset requires some redesign to strengthen and shorten wires, and to improve reliability. A copy of the Ranger evaluation report is included as an appendix.

CONCLUSIONS

1. It is practicable to render tactical radios silent for voice communications by acoustic masking of both the H-189 handset and the Electro-Voice headset, and by incorporating amplifiers to permit whisper operation.

2. Before these devices can be adopted for field use, some further minor development would be required to make the headset more rugged and to find material for both the handset adaptors and headset mouth piece that is not irritating to the skin of users.

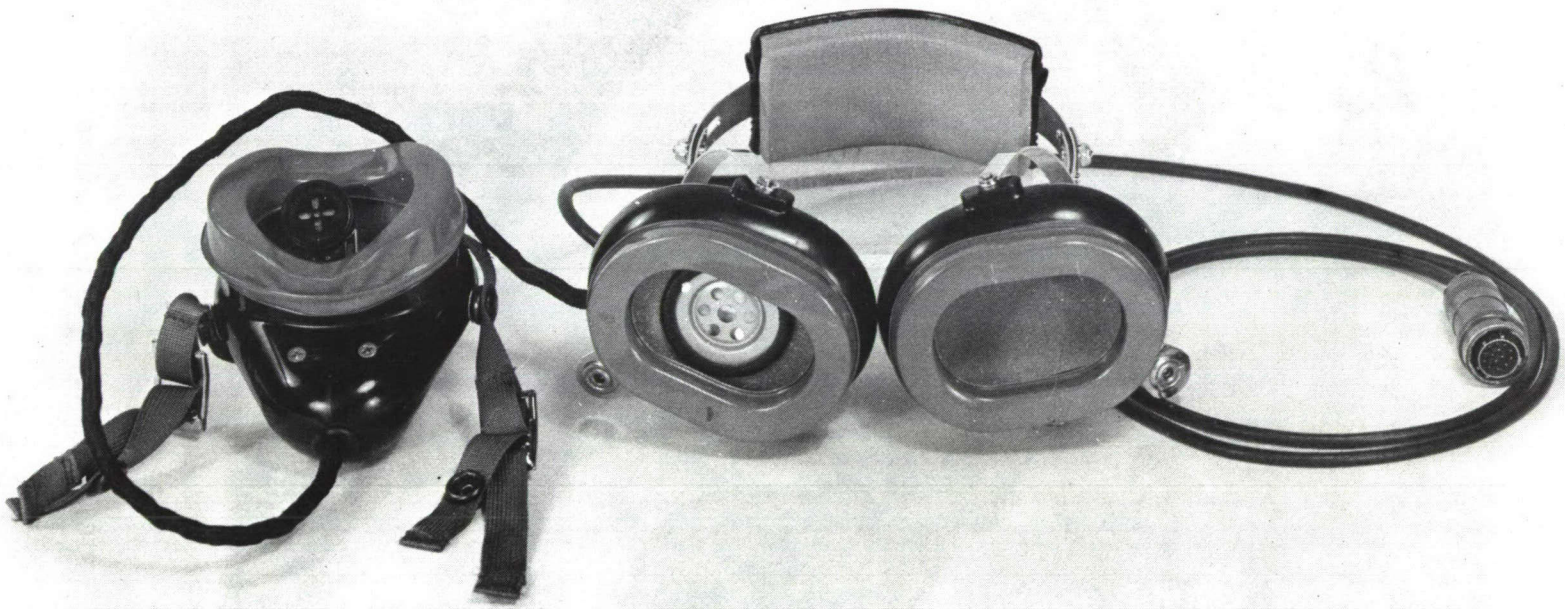

FIG. 1 - Ground Crew Head Sets

FIG. 2 - Silent H-189 Handset

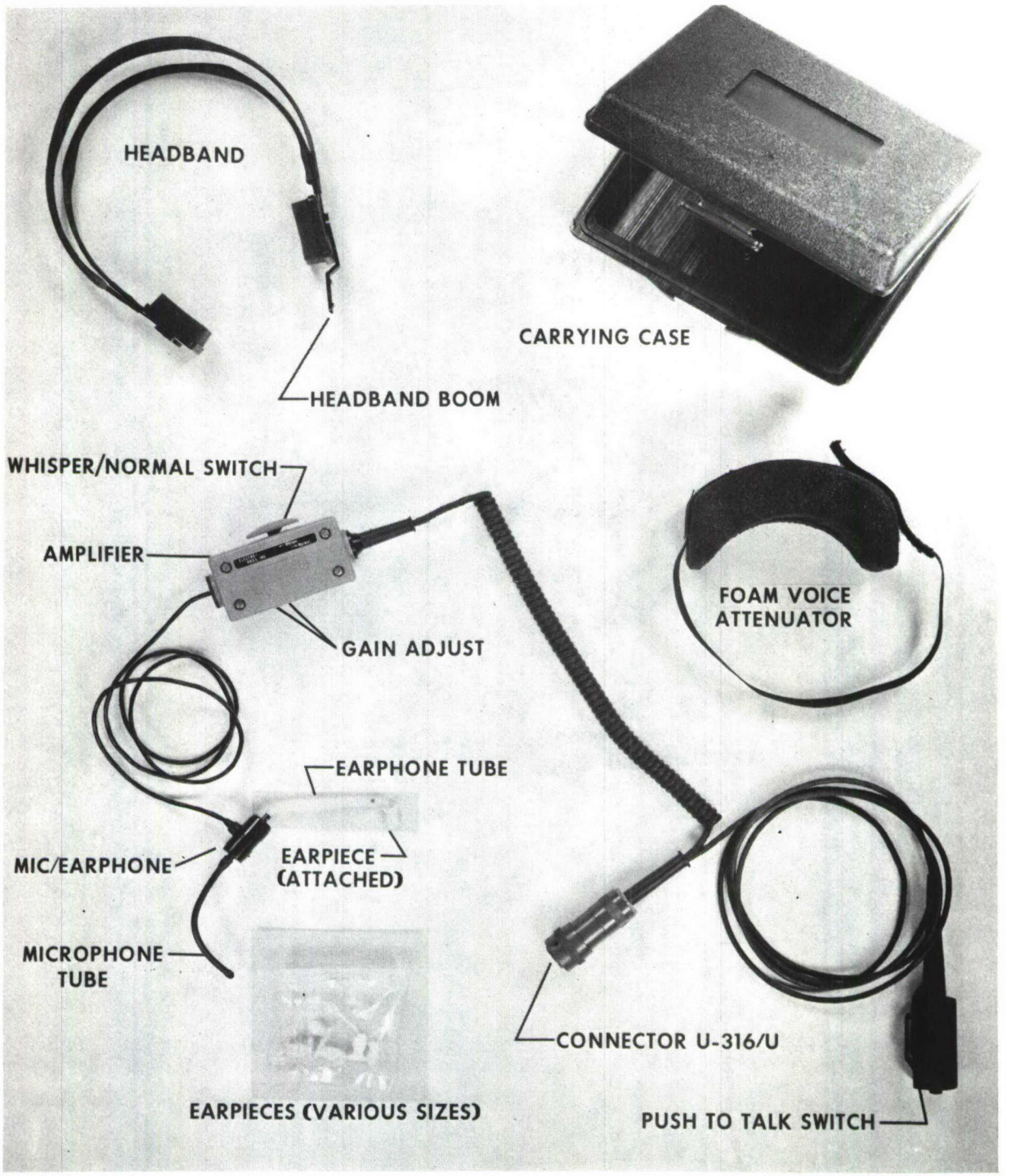

FIG. 3 - Electro-Voice Silent Headset Components

FIG. 4 - Electro-Voice Silent Headset

APPENDIX

RESULTS OF FIELD TEST OF THE LIGHTWEIGHT SILENT HEADSET AND FOAM ADAPTORS

ATSIN-R-FRC

Results of Field Test of the Lightweight Silent Headset and Foam Adapters

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26 Jan 1972

I Test Conditions: The lightweight silent headset and foam adaptors for silent operation of the PRC-77 radio were field tested by the Florida Ranger Camp during Ranger Classes 5, 6, and 7-72 (November, December 1971 and January 1972). The equipment was carried and employed by Ranger students on selected operations during the 12 day FTX during each class. Terrain varied from wet, swampy areas to juniper thickets, to relatively open high ground. Weather conditions consisted of both rain and sunshine with temperatures varying between 25° and 80°. The devices were put into actual use on ambushes and night defensive positions.

II Test Results:

A. The lightweight silent headset does silence voice communications of the PRC-77 radio, enabling the operator to speak in close proximity to the enemy without detection.

B. The headset wires were found to be too long and small in diameter. On a number of occasions they became entangled in the operators load bearing equipment as well as around themselves. This was especially true during night operations.

C. The earpiece tube became easily detached from the set and was extremely difficult to find and replace at night.

D. The whisper/normal switch was found to be less durable than the other components.

E. When the PRC-77 was attached to the rucksack frame, installation of the silent headset was difficult due to the position of the adaptor terminal. i.e. extremely close to the frame. This resolted in breakage of the terminal wires on the headset.

F. The foam mouth piece of the headset was irritating to the skin and uncomfortable.

G. The foam adaptors also rendered the PRC-77 silent for voice communications.

H. Installation of this device was easy. However, the adaptors were found to be irritating to the skin when the operator was wearing insect repellent and camouflage.

ATSIN-R-FRC (26 Jan 72)
SUBJECT: Results of Field Test of the Lightweight Silent Headset and Foam Adapters

III Recommendations:

A. The lightweight silent headset be further developed incorporating the following improvements:

1. Reduce the number of external wires and/or shorten them and increase diameter size.

2. Prevent the earpiece tube from detaching.

3. Strengthen the whisper/normal switch.

4. Construct the foam mouth piece and adaptors of material not irritating to the skin when insect repellent and camouflage is used.

5. Strengthen the terminal plug attaching the headset to the radio.

The Florida Ranger Camp appreciates having the opportunity to test these new devices. I hope our findings will assist you in further development. If we can be of any further assistance please feel free to contact us.

Attachments: 1 operators questionaire. This contains a summary of comments from students who used the devices.

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S-4

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13. ABSTRACT

Operation of tactical radios in enemy territory is frequently restricted by the need to maintain voice silence. The U. S. Army Land Warfare Laboratory developed techniques for accomplishing this by use of acoustic masking devices, supplemented by electronic amplifiers to permit "whisper" modes of operation. Tests confirmed that these approaches provide silencing; voices could not be detected beyond three feet from the source. Further development is required only to militarize the devices.

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